EXHIBIT K

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

COREPHOTONICS, LTD.,
Patent Owner.

Case No. IPR2020-00905
U.S. Patent No. 10,225,479

PATENT OWNER'S RESPONSE TO
PETITION FOR *INTER PARTES* REVIEW

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TABLE OF AUTHORITIES

Cases

PATENT OWNER'S EXHIBIT LIST

Exhibit No	*Description*
2001	Declaration of John C. Hart, Ph.D.
2002	Fredo Durand, Presentation Titled "Photography 101"
2003	Curriculum Vitae of John C. Hart, Ph.D.
2004	Complaint for Patent Infringement, Dkt. No. 1, Case No. 19-cv-4809 (United States District Court, Northern District of California)
2005	Answer to Complaint for Patent Infringement, Dkt. No. 17, Case No. 19-cv-4809 (United States District Court, Northern District of California)
2006	Corephotonics Proposal: "Dual Aperture Image Fusion Technology, Proposed Engagement Framework" (June 22, 2014)
2007	Email chain with emails dating from July and August 2014
2008	Email chain with emails dating from March 2015
2009	Email dated December 21, 2015
2010	Email chain with emails dating from August 2016
2011	Email dated May 23, 2013
2012	Email dated May 23, 2013
2013	Declaration of Eran Kali
2014	Transcript of January 21, 2021 Video-Recorded Deposition of Fredo Durand, Ph.D.
2015	Declaration of Duncan Moore, Ph.D.
2016	Rudolf Kingslake, "Optics in Photography" (1992)
2017	Curriculum Vitae of Duncan Moore, Ph.D.
2018	Email chain with emails dating from June and July 2013
2019	Email chain with emails dating from June and July 2013
2020	Email chain with emails dating from October 2013
2021	Technology Evaluation Agreement dated August 8, 2013
2022	Email chain with emails dating from September 18, 2013
2023	Email dated May 21, 2014
2024	Reserved
2025	Reserved
2026	Deposition transcript of José Sasián, November 9, 2020
2027	José Sasián, Introduction to Lens Design (2019), hardcopy

2028	Tigran V. Galstian, Smart Mini-Cameras (2014)
2029	Dmitry Reshidko and Jose Sasián, "Optical analysis of miniature lenses with curved imaging surfaces," *Applied Optics*, Vol. 54, No. 28, E216-E223 (October 1, 2015)
2030	José Sasián, Introduction to Aberrations in Optical Imaging Systems (2013), hardcopy
2031	Yufeng Yan and Jose Sasián, "Miniature Camera Lens Design with a Freeform Surface," Design and Fabrication Congress (2017)
2032	Peter Clark, "Mobile platform optical design," Proc. SPIE 9293, International Optical Design Conference 2017, 92931M (17 December 2014)
2033	Jane Bareau and Peter P. Clark, "The Optics of Miniature Digital Camera Modules," SPIE Vol. 6352, International Optical Design Conference 2006, 63421F.
2034	Yufeng Yan, "Selected Topics in Novel Optical Design," Ph.D. Dissertation (2019)
2035	Declaration of Jose Sasián, Ph.D. from IPR2020-00489
2036	Transcript of January 26, 2021 Video-Recorded Deposition of Fredo Durand, Ph.D.
2037	U.S. Patent No. 8,989,517 ("Morgan-Mar")
2038	Forsyth and Ponce, "Computer Vision: A Modern Approach" (1st ed.) (2003)

I. INTRODUCTION

Patent Owner Corephotonics, Ltd. submits this response to the Petition filed by Apple Inc., requesting *inter partes* review of claims 1–16, 18, 23–36–38, and 40 of U.S. Patent No. 10,225,479 (Ex. 1001, '479 patent). The Board granted institution on four grounds of obviousness, each involving a combination including at least Parulski (Ex. 1005) with Konno (Ex. 1015). Corephotonics submits that the arguments presented herein and the additional evidence submitted, such as the testimony from Patent Owner's expert witness John Hart (Ex. 2001), demonstrate that Apple has failed to establish obviousness of the challenged claims and that Apple's grounds should be rejected.

II. SUMMARY OF ARGUMENT

Apple's petition suffers from multiple flaws that affect every ground of its petition. Most fundamentally, its obviousness analysis is premised on a plainly incorrect construction of the term "point of view" (POV). As explained below, Apple's construction rewrites the term "point of view" in the claims to mean "field of view" (FOV). However, these two terms refer to two distinct concepts in the art. "Point of view" is a concept that relates to how the shapes and positions of objects within images differ when those images are taken by different cameras, with different locations and orientations. (Ex.

1001 at 5:10–33.) "Field of view," by contrast is the angle that defines how wide a portion of a scene a given camera and lens can capture. (*Id.* at 7:2–22.) It is a property of the camera and lens that is independent of how the camera is located and oriented and of what scene it is directed toward.

The specification uses the terms POV and FOV to refer to these two very different concepts, consistent with the use of these terms in the art. Further, the challenged claims each use both POV and FOV and use these terms to refer to distinct concepts.

Apple's plainly erroneous claim construction, rewriting POV to mean FOV renders each of its grounds incomplete. Apple has attempted to show that the prior art discloses the limitation "fused image with a point of view (***POV***) of the Wide camera" (*id.* at 13:47–48, 15:65–66), by showing the purported fused image has the ***FOV*** of the Wide camera. Apple has provided no evidence that the prior art references, alone or in combination, provide a fused image with the POV of the wide camera, under any proper construction of POV. This is because Apple entirely fails to demonstrate anything about the shapes or positions of objection in the "fused image," which are exactly the things that it must show match the POV of the wide camera, as the '479 patent uses the term POV.

Even setting this fundamental flaw aside, Apple's petition improperly mixes and matches elements from unrelated embodiments of Parulski and other prior art, without a convincing explanation for why a POSITA would have been motivated to do so.

These and other flaws in Apple's obviousness grounds are explained further below.

In addition, there exist considerable objective evidence confirming the non-obviousness of the challenged claims. Corephotonics has, in a non-litigation context, licensed the technology claimed in the '479 patent to numerous companies, including some of the largest smartphone makers in the world. In 2019, Samsung acquired Corephotonics and its camera technologies for $155m. And, critically, Apple itself asked Corephotonics for its patented technology, evaluated and studied it for years, and then asked for a portfolio license from Corephotonics.

III. LEVEL OF ORDINARY SKILL IN THE ART (POSITA)

For purposes of this proceeding, Patent Owner accepts Petitioner's definition of the level of ordinary skill, namely that a POSITA "would include someone who had, as of the claimed priority date of the '479 Patent, a bachelor's or the equivalent degree in electrical and/or computer engineering or a

related field and 2-3 years of experience in imaging systems including image processing and lens design," and that "that someone with less formal education but more experience, or more formal education but less experience could have also met the relevant standard for a POSITA." Ex. 1003, ¶ 13. *See also* Declaration of John C. Hart, Ph.D. ("Hart Declaration") (Ex. 2001), ¶¶ 14-18.

IV. LEGAL STANDARDS

The petitioner has the burden to clearly set forth the basis for its challenges in the petition. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir.2016) (citing 35 U.S.C. § 312(a)(3) as "requiring IPR petitions to identify 'with particularity ... the evidence that supports the grounds for the challenge to each claim'"). A petitioner may not rely on the Board to substitute its own reasoning to remedy the deficiencies in a petition. *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1355 (2018) ("Congress chose to structure a process in which it's the petitioner, not the Director, who gets to define the contours of the proceeding."); *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1381 (Fed. Cir. 2016) (rejecting the Board's reliance on obviousness arguments that "could have been included" in the petition but were not, and holding that the Board may not "raise, address, and decide unpatentability theories never presented by the petitioner and not supported by the record evidence"); *Ariosa*

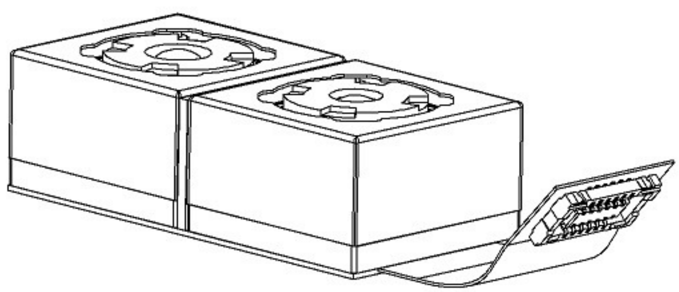
Diagnostics v. Verinata Health, Inc., 805 F.3d 1359, 1367 (Fed. Cir. 2015) (holding that "a challenge can fail even if different evidence and arguments might have led to success"); *Wasica Finance GMBH v. Continental Auto. Systems*, 853 F.3d 1272, 1286 (Fed. Cir. 2017) (holding that new arguments in a reply brief are "foreclosed by statute, our precedent, and Board guidelines").

V. OVERVIEW OF THE '479 PATENT[1]

The '479 patent describes and claims techniques for making "thin digital cameras with optical zoom operating in both video and still mode." (Ex. 1001, '479 patent at 3:27–28.) As the patent explains, zoom is "commonly understood as a capability to provide different magnifications of the same scene and/or object by changing the focal length of an optical system." (Ex. 1001, '479 patent at 1:44–49.) Traditionally, this was accomplished by mechanically moving lens elements relative to one another. (Ex. 1001, '479 patent at 1:49–51.) Another approach is "digital zooming," where the focal length of the lens is kept unchanged, but the image is cropped and digitally manipulated to produce an image that is magnified but has a lower resolution. (Ex. 1001, '479 patent at 1:55–38.)

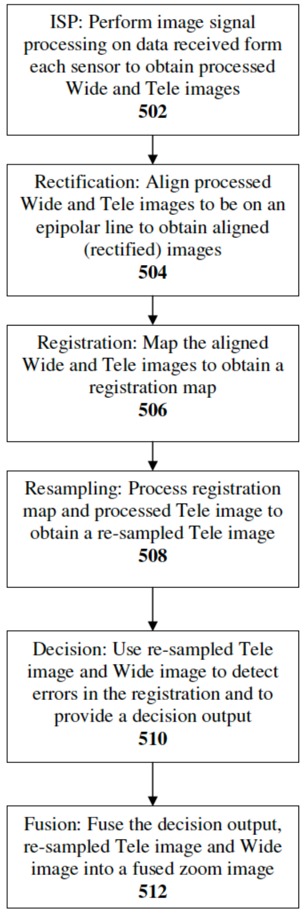
[1] *See* Hart Decl., ¶¶ 31-35.

The ’479 patent describes an approach to approximating the effect of a zoom lens (which varies its focal length) by using two lens systems (a “wide” and a “tele” lens system) with different fixed focal lengths. (Ex. 1001, ’479 patent at 3:34–54.) Various computational means are used to take the images from these two lenses to produce an output that approximate a system with mechanical zoom. This approach can produce a device that is smaller, lower cost, and more reliable than devices that use mechanical zoom. (Ex. 1001, ’479 patent at 1:51–53.)



(Ex. 1001, ’479 patent, Fig. 1B)

Relevant to the claims of the ’479 patent, the specification describes combining still images using the technique of “fusion.” (Ex. 1001, ’479 patent at 3:48–54.) A “fused” image includes information from both the wide and tele images. (Id.) One approach to performing fusion is shown in Figure 5:



(Ex. 1001, '479 patent, Fig. 5.)

Making a compact, high-quality dual-aperture zoom system requires lenses with particular characteristics. The '479 patent teaches lens designs for the tele lens which provide a small "total track length" relative to their focal length, which means that they have a compact size in light of the degree of magnification that they provide. (Ex. 1001, '479 patent at 12:38–53.) One of

the lens designs taught by the '479 patent and covered by several of the challenged claims is shown in Figure 9:

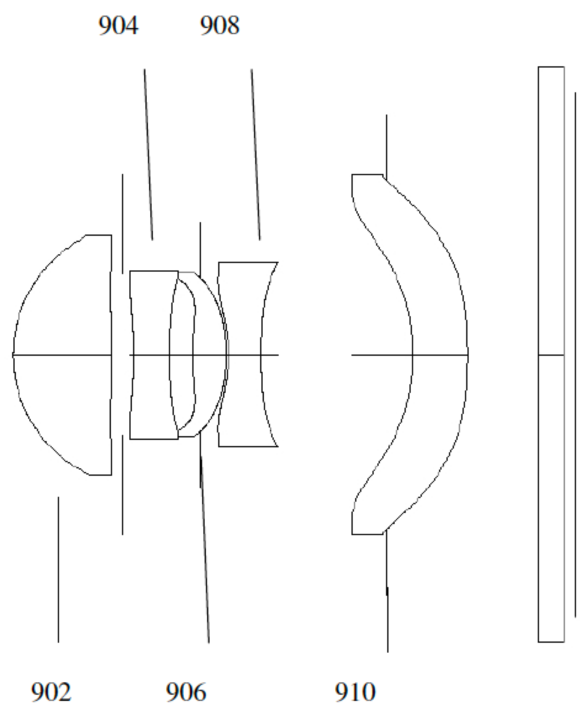


FIG. 9

(Ex. 1001, '479 patent, Fig. 9.)

The lens aspects of the '479 patent are described further in Dr. Moore's declaration. (E.g., Ex. 2015, Moore Decl., ¶¶ 31–34.)

VI. CLAIM CONSTRUCTION

A. "fused image with a point of view (POV) of the Wide camera" (claims 1 and 23)

Petitioner and Dr. Durand contend that this term should be construed as "a fused image that maintains the Wide camera's field of view or both the

Wide camera's field of view and position." (Ex. 1003, ¶¶ 29–33.) Patent Owner disagrees, for the reasons explained below. *See* Hart Decl., ¶ 36.

Under this construction there are two ways to meet the "point of view" requirement. Either, the fused image can maintain the Wide camera's (a) field of view or (b) field of view and position. However, the second of these two options is superfluous, as if the image has both the field of view and position of the Wide camera, then it also necessarily has the field of view of the Wide camera. Apple's construction is logically equivalent to the construction "a fused image that maintains the Wide camera's field of view." *See* Hart Decl., ¶ 37.

Even the superfluous "Wide camera's . . . position" portion of the construction does not line up with the term "position" as it is used in the '479 patent's discussion of "POV." During his deposition, Dr. Durand confirmed that he understood the "Wide camera's . . . position" to refer to the "3D XYZ location of the camera." (Ex. 2036, Durand Depo. at 21:3–7.) But when the specification refers to "position POV" in its discussion of "combination" POVs, it is referring to the "position of either sub-camera *image*." (Ex. 1001, '479 patent at 5:14–16.) That is, "position POV" is based on the positions of images, not the positions of cameras. An image position may differ

because the camera is located in a different position, but it also may differ because camera, located in the same position, has been pointed in a different direction. For this reason as well, Petitioner's proposed construction is inconsistent with how the patent specification uses the relevant terms. *See* Hart Decl., ¶ 38.

The effect of Petitioner's construction is to replace the term "point of view" in the claims with the term "field of view." This is not consistent with how a POSITA would understand these phrases or with how they are used in the '479 patent. For example, claim 1 refers to both "a field of view FOV_W" of the wide camera and "a point of view (POV)" of the wide camera, with no suggestion they are the same thing or that one term is the antecedent basis for the other. (Ex. 1001, '479 patent at 13:25–26, 13:48.) *See* Hart Decl., ¶ 39.

In the specification, the '479 patent clearly defines "FOV" as a planar angle, representable in degrees: "As used herein, the FOV is measured from the center axis to the corner of the sensor (i.e. half the angle of the normal definition)." (Ex. 1001 at 7:11–13.) Examples of FOV values are given in degrees (id. at 7:20–22), and FOV is used as a parameter to the tangent function, further confirming that it is a simple angle (id. at 7:7–8). *See* Hart Decl., ¶ 40.

Dr. Durand agreed during his deposition that his construction of "POV" matches what the patent calls field of view:

> Q. So when you're using the term "field of view" in this construction, you're reviewing -- you're referring to how much of the scene is captured by the camera; is that right?
>
> A. This is a vague version of the definition, I would say one definition of the field of view. For example, the horizontal field of view is to look at the angle between the two edges of the -- of the image.

(Ex. 2036 at 22:4–12.)

This definition matches what the '479 patent specification calls the "normal definition" of FOV (the '479 patent uses half that "normal" value in its formulas). (Ex. 1001, '479 patent at 7:11–13.) *See* Hart Decl., ¶¶ 41-42. As Dr. Durand testified, this FOV is an inherent property of the camera and lens, and independent of where they are pointed or what they see:

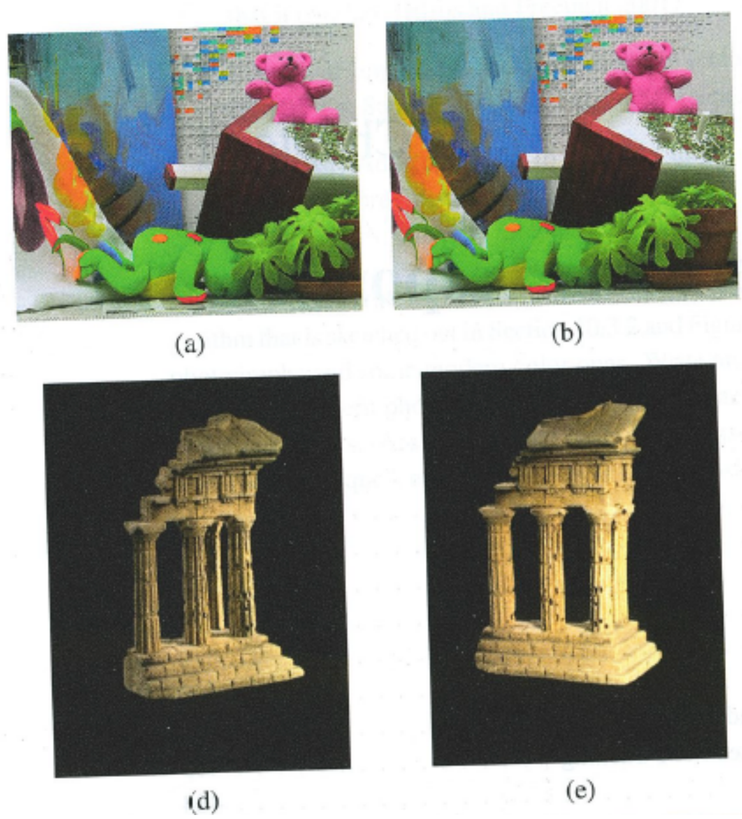
> Q. Would you agree that a camera's field of view is a property of the camera that's independent of what direction the camera is pointing?
>
> A. So one definition or understanding of field of view would be -- would indeed be just an angle that's a property of the combination of a camera and the lens.

(Ex. 2036 at 22:25–23:6.)

POV is defined in the specification quite differently. It refers to how objects are "seen by each sub-camera," i.e., how objects "with be shifted and

have different perspective (shape)" for the two cameras. (Ex. 1001 at 5:10–14.) This POV depends on the position and orientation of the camera and cannot be expressed fully by a single numerical angle. Rather, as the '479 patent explains, using a camera with a different POV can both shift an object (change its position in the image) and change the perspective of an object (changes its apparent shape in the image). (Ex. 1001 at 5:10–16.) *See* Hart Decl., ¶ 43.

Examples of changing POV can be seen in image pairs (a)-(b) and (d)-(e) from Szeliski Figure 1.1:



(Ex. 1013, Szeliski at 468.) *See also* Hart Decl., ¶ 44.

The '479 patent refers to "combination" possibilities where an output image reflects only some aspects of a given POV, such as "Wide perspective POV" or "Wide position POV." (Ex. 1001, '479 patent at 5:15–19.) But, when it refers to "Wide POV," without qualification, it is referring to the complete Wide POV, both perspective and position. (Ex. 1001, '479 patent at 5:10–14; 5:23–26.) *See* Hart Decl., ¶ 45.

In summary, a POSITA would not agree that the term POV in the phrase "fused image with a point of view (POV) of the Wide camera" can be replaced with the distinct term FOV. Further, a POSITA would understand that POV of the Wide camera in this phrase refers to the full Wide camera POV and not to "combination" outputs that have a Wide "perspective POV" and Tele "position POV" or vice versa. (Ex. 1001, '479 patent at 5:13–23.) Therefore, a POSITA would understand this term to mean "fused image in which the positions and shapes of objects reflect the POV of the Wide camera." *See* Hart Decl., ¶ 46.

VII. OVERVIEW OF SELECTED PRIOR ART

A. Parulski[2]

The Parulski patent was published as U.S. Patent No. 7,859,588 and issued on December 28, 2010. (Ex. 1005.) It was filed on March 9, 2007. (Ex. 1005, Parulski, at 1.)

Parulski at the Summary of the Invention includes an overview of the preferred embodiments and their motivations at 7:54 – 8:19. These embodiments include the use of the secondary image from the additional lens "to sharpen portions of the primary image … where the secondary output image is captured … at a different focus position … ; to modify the dynamic range of the primary image … ; to provide scene analysis data for setting the capture parameters for the primary image; or to replace portions of the primary image … with corresponding portions of [a longer exposure] secondary image." Id. at 7:56-8:5. As this list suggests, these various preferred embodiments are designed to achieve different results, and they take different approaches to doing so. A POSITA would not understand all of Parulski's specification (or all of the portions cited by Apple and Dr. Durand) to be part of the same embodiment or even to be compatible with one another. *See* Hart Decl., ¶ 52.

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[2] *See* Hart Decl., ¶¶ 51-71.

Parulski discloses a camera system comprising "the use of two (or more) image capture stages, wherein an image capture stage is composed of a sensor, a lens and a lens focus adjuster, in a multi-lens digital camera in which the two (or more) image capture stages can be used to separately capture images of the same scene so that one image capture stage can be used for autofocus and other purposes while the other(s) is used for capturing an image." Id. at 8:6-13. "More specifically, the non-capturing image stage may advantageously be used to provide a secondary image that can be used to modify or otherwise augment, e.g., the focus or dynamic range of the primary image." Id. at 8:16-19. *See* Hart Decl., ¶ 53.

Parulski uses Figure 1 reproduced below to illustrate an "image capture assembly" including "two imaging stages 1 and 2." Id. at 12:42-43. The image capture stages 1 and 2 comprise the zoom lenses 3 and 4 and the image sensors 12 and 14… ." Id. at 12:66-67. Lenses 3 and 4 "have different focal lengths to provide and extended optical zoom range for the image capture assembly." Id. at 10:15-17. *See* Hart Decl., ¶ 54.

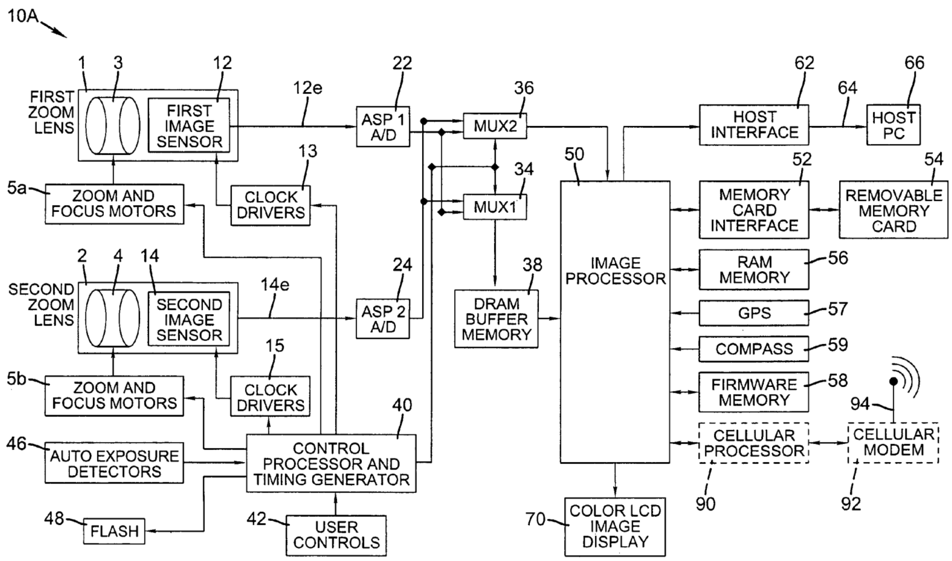

FIG. 1

Parulski discloses that this design can facilitate autofocusing. "The control processor and timing generator 40 controls the digital multiplexers 34 and 36 in order to select one of the sensor outputs (12e or 14e) as the captured image signal, and to select the other sensor output (14e or 12e) as the autofocus image signal." Id. at 14:1-5. "Briefly summarized, the image processor 50 produces the focus detection signals that drive the first and second focus adjusters, that is, the zoom and focus motors 5a and 5b." *See* Hart Decl., ¶ 55.

Parulski uses Figure 3, reproduced below, to show how the image capture assembly in Figure 1 is used to capture images.

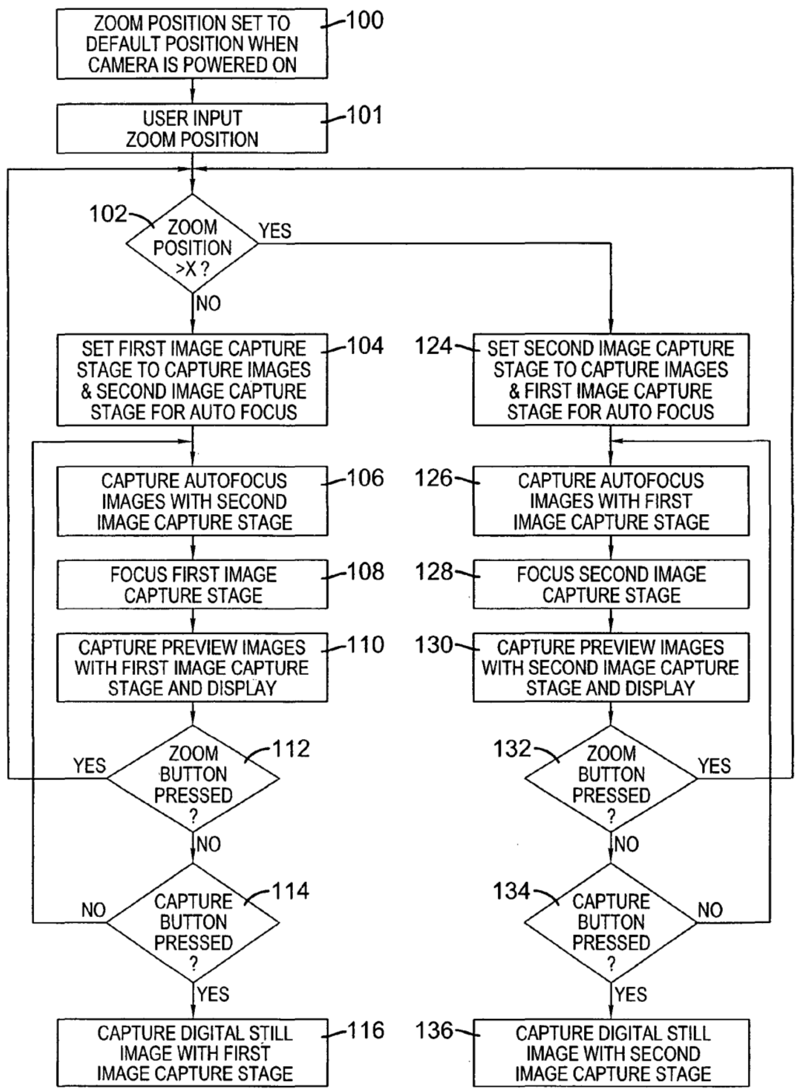

FIG. 3

The decision at block 102 uses the zoom position to determine whether the first stage (image capture stage 1 in Fig. 1) or the second stage (image capture stage 2 in Fig. 1) has the more appropriate focal length for that zoom setting. As an example, we can assume that the zoom position is not greater

than X and the steps on the left hand side of Fig. 3 starting with 104 are selected, previewing images from the first stage and using the second stage to assist the autofocus of the first stage.[3] *See* Hart Decl., ¶ 57.

Block 108 represents the step in Fig. 3 that represents the action of the image processor (block 50 in Fig. 1) that accesses the images captured by both stage 1 and stage 2. "In block 104 … the first image capture stage 1 is used to capture images in the preview mode, while the second image capture stage 2 is used to capture autofocus images. The first image capture stage 1 continues to capture images for preview on the display 70 (block 110) while, in block 106, the second image capture stage 2 is used to capture autofocus images for autofocus of the first image capture stage 1, which are processed by the image processor 50 and used in block 108 to focus the first image capture stage 1." Id. at 15:57-67. *See* Hart Decl., ¶ 58.

Parulski discloses three options for block 108: "rangefinder," "hill climbing" and "rangemap." *See* Hart Decl., ¶ 59.

[3] During his deposition, Dr. Durand testified that the only situation where he had offered an opinion that Parulski satisfied the necessary claim elements was when the zoom position equals 1 (no zoom) and the output field of view equals the wide image view of view. (Ex. 2036, Durand Depo. at 64:20–65:3, 65:18–67:5.) Given that this is Dr. Durand's position, the case where the zoom position is greater than X is not relevant to Dr. Durand's opinions.

The "rangefinder" option is shown in Fig. 4, reproduced below Step 258 indicates that the shutter button is pressed halfway down (S0 → S1), initiating autofocus. "The cropped and upsampled autofocus image is then correlated with the other autofocus image to identify the pixel shift between the two autofocus images (block 264) and thereby produce the focus detection signal." Id. at 16:54-58. Step 266 indicates a "rangefinder calibration curve" is used to convert the "focus detection signal" into the single value sent by step 268 to focus the "first image" in block 108 of Fig. 3. *See* Hart Decl., ¶ 60.

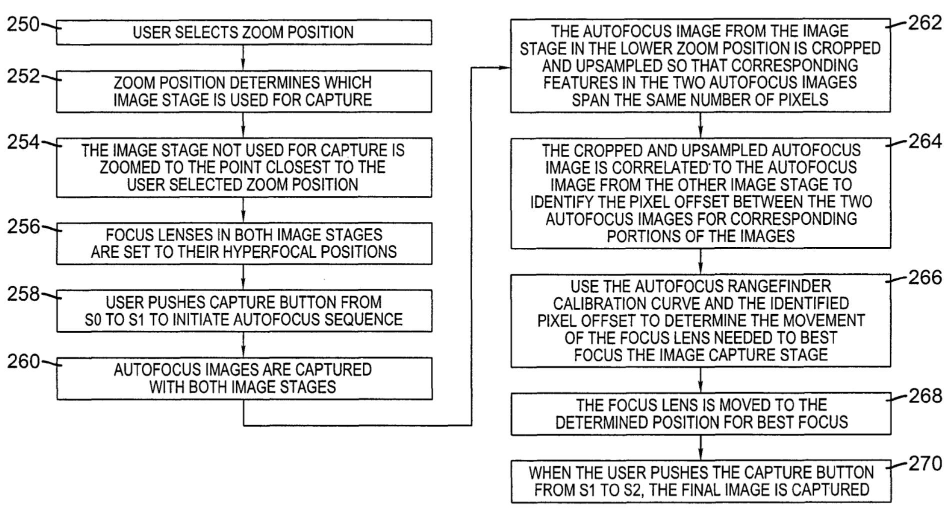

FIG. 4

The "hill climbing" option is illustrated in Fig. 5 and disclosed by Id. at 17:7-56. It uses the second capture stage to experimentally adjust its focus

to maximize contrast to find the optimal focus setting for the first capture stage. The advantage of this approach is that the iterated adjustments in the second capture stage can remain hidden while the user observes the preview image updated in the first capture stage, even while adjusting zoom settings or reorienting the camera to different focal points in the scene. *See* Hart Decl., ¶ 61.

The "rangemap" option is illustrated in Fig. 11, reproduced below, and disclosed by Id. at 21:49-22:49. The "rangemap" option uses the rangefinder calibration curve in block 482. Whereas a single pixel offset is used to produce a single range value in the "rangefinder" option, block 482 shows that the "rangemap" option determines "the distances to different portions of the images." Id. at 20:15. *See* Hart Decl., ¶ 62.

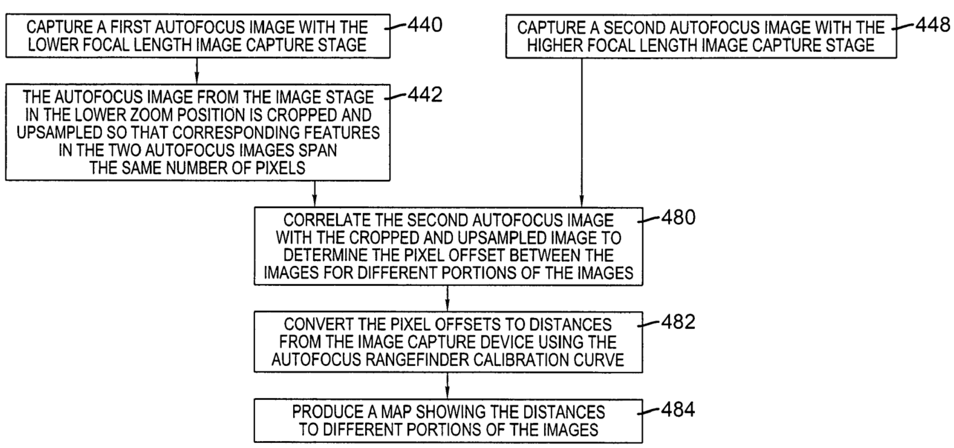

FIG. 11

This range map is described as being usable "for a variety of purposes" (id. at 20:51–21:6), but it is noteworthy that none of the example uses listed in the specification involves "fusing" or otherwise combining image data from the two images. The first three example all involve identifying object boundaries or motion tracking of objects, which does not have anything to do with fusion, per se. (Id. at 20:54–62.) The fourth example describes blurring portions of the output image. (Id. at 20:63–65.) The last three examples describe increasing or decreasing the brightness of portions of the image. (Id. at 20:66–21:6.) *See* Hart Decl., ¶ 63.

A POSITA would not understand the discussion of "blurring" in connection with Fig. 11 (id. at 20:63, 21:36–44) to be referring to fusing two images. *See* Hart Decl., ¶ 64. Rather a single image (or portions of the image) can be digitally blurred using a variety of techniques. *Id.* Generally speaking, blurring an image involves reducing the magnitude of the high-frequency components of a image, while leaving the low-frequency components alone. *Id.* This has a similar effect to that of averaging the brightness values of the pixels in each local portion of the image. *Id.* One approach to blurring is to calculate the Fourier transform of an image to compute its frequency components, reduce the high frequency components using a filter, and then perform

an inverse Fourier transform on the result. *Id.* This general approach is described, for example, in the Morgan-Mar reference that Apple relies on in the -00906 IPR. (*Id.*; Ex. 2037, Morgan-Mar at 3:36–54.)

Likewise, the discussion of the dog being "sharpened" would not be understood by a POSITA to refer to fusing two images. (Ex. 1005 at 21:30–31.) *See* Hart Decl., ¶ 65. The same Fourier transform techniques used to blur can be used instead to sharpen—e.g., making edges in the image more prominent—by increasing the high-frequency components rather than decreasing them. *Id.* This is also explained in Morgan-Mar: "In the Fourier domain, N is not constrained to being an integer. As long as N>1, the blurring of the background is increased. If N<1, the blurring of the background is reduced; in other words the background is sharpened, mimicking the effect of a greater depth of field than the original images." (*Id.*; Ex. 2037, Morgan-Mar at 11:33–38.)

Whereas "Fig. 3 depicts a flow diagram showing a method for performing autofocus and for capturing digital still images according to a first embodiment of the digital camera shown in Fig. 1" and "Fig. 8 depicts a flow diagram showing a method for performing autofocus and for capturing digital video images according to a first embodiment of the digital camera shown in Fig. 1[,]" "Fig. 14 depicts a flow diagram showing a method for enhancing

the depth of field of an image by using images from both image capture stages according to an embodiment of the invention." Ex. 1005 at 8:34-37, 48-51 and 9:1-4. Parulski identifies a special, different method for "enhancing the depth of field of an image" than was disclosed for "performing autofocus and for capturing digital still images."

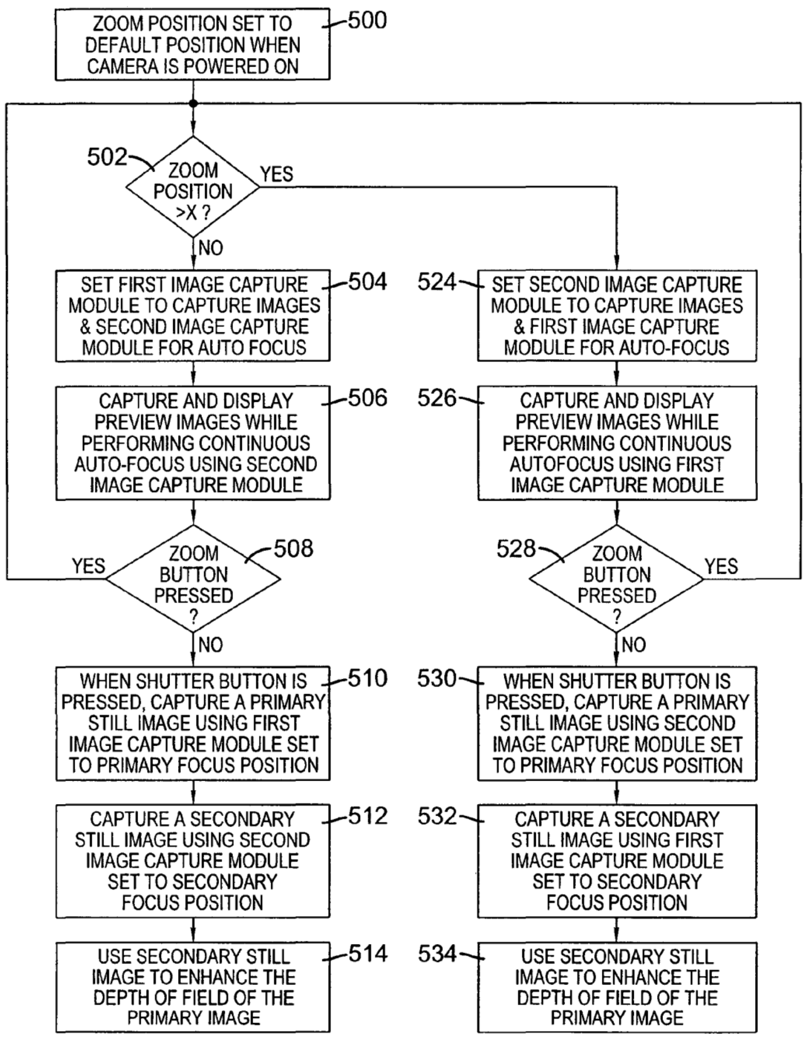

FIG. 14

As before, we can focus on a case that the zoom position is not greater than X and focus the discussion on the left side of the flow diagram starting with block 504. *See* Hart Decl., ¶ 67. In blocks 504 and 506, the first image capture stage is used to capture and preview images while the second image capture stage is used to "capture autofocus images for autofocus of the first image capture stage." Ex. 1005 at 22:28-29. When the shutter button is pressed, then block 510 indicates a primary still image is captured from the first image capture module and block 512 indicates a secondary still image is captured from the second image capture module. *See* Hart Decl., ¶ 67.

Block 514 indicates that the secondary image is used to enhance the depth of field of the primary image. "Then, in block 514, the secondary still image is used to enhance the depth of field of the primary image, for instance, where the secondary still image is used to provide an enhancement signal that can be used to sharpen portions of the primary still image that are positioned near the secondary focus distance." Ex. 1005 at 22:35-42. *See* Hart Decl., ¶ 68.

This description of the "enhancement signal" is unclear. *See* Hart Decl., ¶ 69. The term "enhancement signal" appears at 12:17-18, 22:40,63 and 23:1, where it is used to "e.g., sharpen portions of the primary still image that are

positioned near the secondary focus distance" (Ex. 1005 at 12:18-20), or "to sharpen portions of the primary still image that are positioned near the secondary focus distance" (Id. at 22:40-42, 64-65 and 23:2-3). *See* Hart Decl., ¶ 69. The enhancement signal is "generated by the camera" or is "generated by the eternal processor" (Id. at 22:63-23:3) but without any disclosure of what is generated or how it is generated. *See* Hart Decl., ¶ 69.

The term "range map" never appears in Parulski's disclosure of enhancing the depth of field at 22:14-23:3. Furthermore, this disclosure of enhancing the depth of field describes a different flow diagram (Fig. 14) than the ones capable of producing a range map (Figs. 3 and 8). It would not be obvious to a POSITA how to modify the method shown in Fig. 14 to generate both a range map and to autofocus the images captured by both stages. *See* Hart Decl., ¶ 70.

Assuming the "enhancement signal" were a range map (which is never suggested by Parulski), however, the discussion of Figure 14 in column 22 of Parulski does not describe a "fused image," because sharpening using a range map would involve sharpening the edges present in specific portions of the primary still image, rather than transferring image data from the secondary

still image into the output image. (Ex. 1005 at 22:37–42.) *See* Hart Decl., ¶ 71.

VIII. OBVIOUSNESS

A. Claims 1, 10–14, 16, 18, 23, 32–26, 38, and 40 Are Not Obvious Over the Combination of Parulski and Konno (Ground 1)

Petitioner relies on hindsight and to combine cherry-picked portions of embodiments of Parulski to create a Frankenstein embodiment that Parulski neither disclosed nor preferred. In his analysis for limitations [1.5.1] and [1.5.2] (Ex. 1003, Durand Decl. at 47–53), and thus in his analysis for limitations [23.3] and [23.4], which simply refers back to these limitations (id. at 63), he relies on three portions of Parulski: (1) 20:1–15, 20:50–59, and 21:34–44 discussing Figure 11; (2) 22:14–42 discussing Figure 14; and (3) 28:45–57 discussing Figure 26. Hart Decl., ¶ 72.

Figure 11 describes a method "wherein a range map is produced." (Ex. 1005, Parulski at 19:49–51.) The Figure 11 discussion is the only portion of Parulski that Dr. Durand cites as satisfying the "by mapping Tele image pixels to matching pixels within the Wide image" portion of limitation [1.5.2]. (Ex. 1003, Durand Decl. at 52–53.) However, as explained above, nothing in the discussion of Figure 11 describes using the range map as part of a system that outputs a "fused image." Hart Decl., ¶ 73. Identifying objects within an image,

tracking motion, blurring portions of an image, or adjusting gain would all be understood as operations that could utilize a range map, but would not need to fuse image data from two different images. *Id.* Likewise, the image capture assemblies of Figures 3 and 8, which Parulski says Figure 11's method uses, do not fuse data from two different images. (Ex. 1005, Parulski at 19:49–51.)

Nowhere else does Parulski describe using the Figure 11 method together with image fusion. Hart Decl., ¶ 74. Indeed, the only reference to using the Figure 11 method (or any "range map") at all in the rest of Parulski describes using the range map, together with GPS location and direction information to determine the geographic locations of portions of the scene. (*Id.*; Ex. 1005, at 24:52–25:15.)

Dr. Durand cites the motivation of focusing on both a foreground dog and a background mountain of Parulski at 21:7-44. However, nothing in the passage describes combining portions of the wide and tele images. The paragraph describes a series of modifications to a wide image that can be made without directly incorporating image data from the tele image, or using the tele image for any reason other than generating range data. It describes "applying gain adjustments to . . . portions ***of the image***" (id. at 21:17–24), which can readily be done directly to the wide image data. *See* Hart Decl., ¶ 75.

Likewise, "blurring" and "sharpening" can be done directly on the wide image data (using for example the Fourier transform techniques discussed above), without importing image data from elsewhere. Indeed, the blurring and sharpening described would, in general, need to work without importing tele image data. *Id.* This is because background objects in the wide image, such as the mountains in Parulski's example will generally extend beyond the area visible in the tele image, and limiting the blurring or sharpening to the regions visible in the tele image would not achieve the results described in Parulski. *Id.*

The description of an image that has both the dog and the mountains in focus, with the intermediate parts of the scene blurred, (id. at 21:40–44) would be achieved using image data from the wide image, without any need for importing image data from the tele image. The dog is described as being "5 feet away" (id. at 21:12–13), and Parulski teaches that a single wide angle lens, set to its hyperfocal distance, will have objects from 4 feet to infinity in focus (id. at 21:59–61). *See* Hart Decl., ¶ 76.

As for the discussion of Figure 14 and Figure 26, neither mentions using a range map, and neither provide any detail on how the two images are fused, if at all. The Figure 14 discussion refers to use of an "enhancement signal that can be used to sharpen portions of the primary still image." (Id. at

22:39–42.) Parulski does not specify that the enhancement signal actually contains image data from the secondary image, and it does not specify how the enhancement signal is used. As explained above, sharpening can be performed to enhance edges based solely on the data from a single image. Thus, the enhancement signal could be something as basic as a signal telling the system to sharpen a particular portion of the primary image, without containing any information about depth or any image data from the secondary image. *See* Hart Decl., ¶ 77

The Figure 26 discussion states that "the two images are combined into a modified image with a broadened depth of field." (Id. at 28:52–53.) However, it says nothing at all about how the images are "combined" or what the characteristics of that image are beyond the "broadened" depth of field.

Even assuming that a POSITA would cobble the cherry-picked quotes from Dr. Durand's analysis into a new system, as Dr. Durand suggests, Dr. Durand has not shown that this new system would satisfy the "fused image with a point of view (POV) of the Wide camera" limitation, under its proper construction. Dr. Durand's sole argument that Parulski meets this limitation is based on the output im-age having the "wide image's field of view." (Ex. 1003, Durand Decl. at 51.) He does not even address the optional portion of

his proposed claim construction, "the Wide camera's . . . position." Dr. Durand confirmed that his sole theory for satisfying the POV limitation was based on the output FOV during his deposition, when he testified that his only theory for in-fringement was when the zoom position equals 1 (no zoom) and the output field of view equals the wide image view of view. (Ex. 2036, Durand Depo. at 64:20–65:3, 65:18–67:5.)[4] *See* Hart Decl., ¶ 79

As explained above, the '479 patent's discussion of POV defines it with respect to shapes (perspectives) and positions of the objects within images. (Ex. 1001, '479 patent at 5:11–33.) Nothing in this discussion even suggests that FOV is relevant to the question of POV, let alone that it is the same thing. Nothing in Parulski suggests that whatever image data from the tele image that might be "fused" into the output would be modified to have the shapes and positions from the wide image POV. And nothing in Dr. Durand's declaration even attempts to establish this would be true. As a result, Dr. Durand has failed to show that any combination of Parulski with the other references

[4] The questions asked of Dr. Durand here appear to conflate "X" with the zoom position, rather than being a threshold value of the "X" position where the primary and secondary image capture modules switch roles. This reflects a misreading of Parulski's figures at that time by the questioning attorney. However, Dr. Durand's answers are clear that he believes Parulski only meets this limitation when no zoom is applied to the wide image and the output image has the same field of view as the wide image.

satisfies the limitations of the independent claims. Since Dr. Durand has not offered any other theory for how Parulski or any other prior art reference satisfies the "fused image with a point of view (POV) of the Wide camera" limitation in any of the claims challenged in this IPR, he has also failed to demonstrate that any obvious combination of references satisfies any of these challenged claims under any ground. *See* Hart Decl., ¶ 80.

B. Claims 2–4 and 24–26 Are Not Obvious Over the Combination of Parulski, Konno and Szeliski (Ground 2)

Dr. Durand opines regarding Claim 2 at pp. 71-71 that "[a] POSITA would have recognized that applying Szeliski's rectification process to Parulski's cell phone camera would yield rectified Wide and Tele images" and that "[a] POSITA also would have understood that these rectified images would then be used in Parulski's method for performing more efficient pixel matching in deriving the range map." However, Parulski was filed Mar. 9, 2007, and image rectification was already well known to a POSITA at that time. For example, image rectification was covered in the popular textbook "Computer Vision: A Modern Approach" by Forsyth and Ponce (First Edition) (2003) at 325–26 (Ex. 2037). If rectification was an obvious improvement to Puralski to a POSITA on June 13, 2013, then it would have been an obvious

improvement to Puralski to a POSITA (including Puralski) on Mar. 9, 2007. *See* Hart Decl., ¶ 81.

Dr. Durand cherry-picked rectification from Szeliski in a hindsight attempt to modify Parulski toward the '479, and provides no reason why a POSITA would use rectification over other alternatives. Szeliski §11.1.1 "Rectification" is immediately followed by §11.1.2 "Plane sweep" which is "[a]n alternative to pre-rectifying the images before matching… ." (Ex. 1013, Szeliski at 474.) "The choice of virtual camera and parameterization is application dependent and is what gives this framework a lot of its flexibility. In many applications, one of the input cameras (the reference camera) is used, thus computing a depth map that is registered with one of the input images." *Id.* at 475. Hence the plane sweep would be useful for constructing a range map, especially for the '479, because its depths would be registered specifically with respect to the Wide image point of view. *See* Hart Decl., ¶ 82.

C. Claims 5–9 and 27–31 Are Not Obvious Over the Combination of Parulski, Konno, Szeliski and Segall (Ground 3)

Parulski is directed at a camera consisting of multiple image capture stages, whereas Segall, in particular the portions cited by Dr. Durand, is directed at devices consisting of a single image capture stage. Parulski's registration relies on "Stereo-Based Image Processing" (Parulski at 19:53-20:49)

whereas Segall's registration relies on "motion estimation" (Segall at 4:33-5:23). A POSITA would have understood that the registration produced by the simple global "epipolar" disparity of stereo images from multiple simultaneous photographs would have fewer errors than would the registration obtained through motion estimation of a sequence of frames with a single moving camera as well as an articulated scene with multiple surfaces moving in different directions. *See* Hart Decl., ¶ 83.

Furthermore. Segall's "Mis-Registration Detection" cited by Dr. Durand's four line excerpt of Segall was actually the introduction of an entire section of Segall 6:43-9:61 including portions on temporal consistency and other issues of motion compensation registration that a POSITA would have realized would have added significant wasted effort when applied to a simpler and less error-prone stereo registration. *See* Hart Decl., ¶ 84.

D. Claims 15 and 37 Are Not Obvious Over the Combination of Parulski, Konno and Stein (Ground 4)

The '479 includes a clever scheme for synchronizing the rolling shutter signals of its Wide and Tele CMOS sensors. One of the objectives of this design was to "minimize the required bandwidth from both sensors for the ISPs" ('479 at 7:56-57). Another objective is that "matching FOV's in both images (Tele and Wide) are scanned at the same time" but this would have little

impact in anything other than trick photography that reveals the limits of a CMOS sensor by setting the exposure time too fast. *See* Hart Decl., ¶ 85.

Dr. Durand opines that it would have been obvious for a POSITA to combine Parulski and Konno with Stein to incorporate the latter's synchronization of a CMOS shutter to produce a similar result to '479. That is incorrect, for several reasons. *See* Hart Decl., ¶ 86.

First, the POSITA would have needed to be motivated to seek this synchronization. Parulski's examples, including landscapes with mountains, flowers and a sitting dog, provide little high-speed motion to motivate the need for careful synchronization of the image signals. Parulski's design also provides little motivation for the need of increased bandwidth between sensors and processors, as Parulski design includes an interface to an external PC that can be used in the computation of a range map. *See* Hart Decl., ¶ 87.

Second, even if a POSITA was motivated to reduce the bandwidth needed between the sensors and the processor, the POSITA would not have looked to the automotive industry for a solution. The synchronization of CMOS sensors is important to Stein not because of any reduction in bandwidth, but because multiple vehicle cameras have to register fast moving scenes, so it is important that the rolling shutters are synchronized. Cameras

used for driver assistance systems do not provide images intended for human viewing, and are less concerned with rolling shutter image artifacts than the images produced by the cameras of the ‘479. The fact that two very different problems (fast scene registration for Stein v. bandwidth reduction for ’479) were solved by a similar synchronization approach is coincidental. The combination of Stein with Parulski is due not to obviousness, but to hindsight. *See* Hart Decl., ¶ 88.

IX. SECONDARY CONSIDERATIONS / OBJECTIVE INDICIA OF NON-OBVIOUSNESS

The challenged claims of the ’479 patent are not proven to be obvious for the additional reason that there is objective evidence of secondary considerations supporting their non-obviousness. “Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy.” *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966). Evidence of such secondary considerations assists the fact finder to “turn back the clock and place the claims in the context that led to their invention.” *Mintz v. Dietz & Watson, Inc.*, 679 F.3d 1372, 1378-79 (Fed. Cir. 2012).

There are several secondary considerations of non-obviousness indicating that Petitioner has not sufficiently demonstrated the challenged claims are obvious in view of the prior art references identified by Petitioner. These secondary considerations include at least industry praise, licensing, commercial success, and failure of others / copying. *See* Hart Decl., ¶¶ 114-16.

First, the Petition, Dr. Durand's declaration (Ex. 1003), and Dr. Saisian's (Ex. 1021) declaration are silent as to whether there is evidence of secondary considerations of non-obviousness as to the challenged claims. *See* Hart Decl., ¶ 118.

Second, the critical aspects of the '479 patent can be divided into two categories: first, (1) a dual aperture camera design with Corephotonics' inventive telephoto lens; and second, the (2) use of image fusion techniques to output a fused image using images from both Wide and Tele cameras. For example, the '479 patent provides an embodiment of a "dual-aperture zoom imaging system" which includes a "Wide imaging section" and a "Tele imaging section." *See* Ex. 1001, at 4:29-52. For example, the Tele lens "has a respective effective focal length EFLT and total track length TTL_T fulfilling the condition $EFL_T/TTL_T>1$." *Id.*, at cl. 1. The '479 patent also describes the use of "a camera fusion processing core" which, performs an algorithm which

results in a "fusion step" where "re-sampled Tele image and the Wide image are fused into a single zoom image." *See id.*, at 9:39-60. As shown below, Patent Owner is entitled to a presumption of nexus between these aspect of the invention and the secondary considerations. *See* Hart Decl., ¶¶ 119-20.

A. Industry Praise / Licensing

Industry praise and licensing support non-obviousness. Petitioner and Patent Owner had extensive and detailed discussions regarding Petitioner's use of Patent Owner's technology. Patent Owner's public complaint, in *Corephotonics, Ltd. v. Apple Inc.*, Case No. 6:19-cv-04809-LHK (Dkt. No. 1) (Ex. 2004) ("Complaint"), provides a great amount of detail regarding those discussions, which lasted from 2012 to 2017. *See* Ex. 2004, at ¶¶ 28-44. Petitioner's "Answer" to Patent Owner's public complaint in relevant part "admits" that "Apple personnel attended meetings with Corephotonics personnel to discuss a potential business arrangement." *See, e.g.*, Ex. 2005 at ¶¶ 28-44; Hart Decl., ¶ 121.

The operative questions include whether the allegations in Patent Owner's public complaint concerning Petitioner's attempt to license Patent Owner's technology are supported by evidence and whether there is a nexus

between those licensing discussions with the invention of the '479 patent. The answer is "yes" to both questions. Hart Decl., ¶ 122.

Patent Owner has provided documentary evidence and declaration testimony detailing Corephotonics's business, its licensing history, the relevant facts as to the technology licensing discussions between Patent Owner and Petitioner, and several documents that corroborate Patent Owner's Complaint. *See, e.g.*, Declaration of Eran Kali, at ¶¶ 17-26 ("Kali Decl." or "Kali Declaration") (Ex. 2013); Hart Decl., ¶ 123. Several communications and documents are provided and described below for exemplary purposes.

- Exs. 2011 and 2012 is a pair of emails from an Apple engineer to Corephotonics on May 23, 2013, in which he expresses an interest in learning more about Corephotonics's technologies and intellectual property, including "software that fuses wide angle and telephoto video together," "sensor synchronization," "MIPI signaling and image processing requirements," and "image registration in GPU followed by color reproduction in hardware ISP." These emails appears to be referenced in paragraph 29 of the Complaint.

- Ex. 2018 is an email chain between Apple and Corephotonics following a visit by Corephotonics to an Apple facility. An Apple engineer wrote, on June 28, 2013: "***As we discussed during your visit, we are interested in evaluating your image fusion algorithms in more depth***." In response, Corephotonics said it would "***be happy to make our algorithm available for your evaluation***." Moreover, at this visit, Corephotonics presented its telephoto lens design to Apple, including key characteristics such as [redacted]

[redacted] Kali Decl. ¶ 25.

- Ex. 2019 is an email chain between Apple and Corephotonics engineers from July 2013. On July 3, 2013, Corephotonics provided samples of fused images generated using Corephotonics' image fusion algorithms. In response, an Apple engineer stated: "***Thank you for the images. We don't see any parallax issues, and the Corephotonics images blend the wide and tele camera image data very smoothly***."

- Ex. 2021 is a copy of a Technology Evaluation Agreement dated September 9, 2013, [redacted] Ex. 2022.

- Ex. 2020 is an email chain between Apple and Corephotonics engineers discussing, among other things, samples of images generated by Corephotonics's fusion algorithms. An Apple engineer noted, on October 15, 2013: "We'll analyze the images further on our side but the first glance shows that ***the images look quite good***." After further evaluation, Apple followed up: "***My initial impression of the images CP provided has been quite positive***."

- Ex. 2023 is an email from an Apple engineer to Corephotonics dated May 21, 2014. In that email, Apple informs Corephotonics: "We had a very positive meeting with company executives on Monday. We showed our results and your module to people in charge of software, hardware, product

design and industrial design and there was a very clear message that this is something we want to continue to investigate."

- Ex. 2006 is a presentation dated June 22, 2014 addressed to "Apple strategic deals team" and which was provided to Apple executives on or around June 22, 2014. This presentation appears to be part of the information which Corephotonics alleges it provided to Apple in paragraph 35 of its Complaint. The presentation is titled "Dual Aperture Image Fusion Technology - Proposed Engagement Framework."

- Ex. 2007 is an email chain between Apple and Corephotonics executives and engineers (including Gal Shabtay, one of the named inventors). The top-level email, dated August 5, 2014, is an email from an Apple executive to Corephotonics, requesting that Corephotonics provide a number of eleven "top level deliverables," including: "2. ***Still image fusion code which does not suffer from artifacts from high speed local motion***." This email appears to support Corephotonics's allegation regarding Apple's intention to evaluate Corephotonics's technology as alleged in paragraph 36 of the Complaint. The Complaint states in paragraph 33 that the relevant software was provided by Corephotonics to Apple on a confidential and NDA basis, including as part of a "black box" set of algorithms and simulations.

- Ex. 2009 is an email from a Corephotonics executive, David Mendlovic, to Apple executives, stating "[O]ur IP portfolio is the widest and in our opinion has the best defensive value for such applications." This email is quoted in paragraph 39 of the Complaint.

- Ex. 2010 is [redacted]

As the evidence shows, the licensing discussions between Petitioner and Patent Owner lasted over many years. Hart Decl., ¶ 124. Petitioner specifically asked Patent Owner for an "[redacted] in August 2016. Apple specifically asked for, and received, technological samples of Corephotonics' lens designs and Corephotonics' image fusion algorithms. *See* Exs. 2007, 2011, 2012, 2018, 2019, 2020, 2021, 2022, Kali Decl., at ¶¶ 17-30. The licensing discussions specifically would have encompassed the lens design and image fusion technology that Patent Owner had provided, on a confidential and NDA basis, to Apple years earlier. It specifically would have also encompassed a license to Corephotonics's U.S. Patent No. 9,185,291 (the "'291 patent"), to which the '479 patent claims priority. This is evidence that there is a "nexus" between the licensing negotiations between Patent Owner and Petitioner as the claims of the '479 patent challenged by Petitioner in this proceeding. Petitioner's years-long effort in studying Patent Owner's patented technology (and specifically the technology at issue in the '479 patent), combined [redacted], demonstrates Petitioner's respect for Patent Owner's technology and the non-obviousness of the challenged claims. *See* Hart Decl., ¶ 124.

Like Apple, numerous other technology companies have recognized the value in Patent Owner's camera and image processing technology and taken licenses to Patent Owner's patented technology. These companies include, OPPO Mobile Telecommunications[5], one of the top 5 global smartphone vendors, and Samsung Electro-Mechanics[6]. Other companies who have taken licenses to Corephotonics's technology include [redacted]

See Kali Declaration, ¶¶ 11-16. The fact that several companies have taken licenses to Corephotonics' technology is evidence of industry-wide respect for the patented technology. *See* Hart Decl., ¶ 125.

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[5] https://corephotonics.com/press-releases/oppo-signs-strategic-license-with-corephotonics-for-next-generation-mobile-handset-cameras/

[6] https://corephotonics.com/press-releases/corephotonics-collaborates-samsung-electro-mechanics-bring-new-era-imaging-smartphones/

Corephotonics has been described as a "leader in multi-camera technology,"[7] "a world-renowned leader in the mobile imaging space,"[8] "a leading supplie[r],"[9] and a "key player" in the computational photography market[10]. As early as 2015, Corephotonics had already been recognized as the industry leader in developing dual-camera designs and software technologies to power them, with industry observers speculating: "All this raises the question of whether Apple will use a Corephotonics module."[11] Widespread praise of Corephotonics's technologies is yet further evidence of non-obviousness. *See* Hart Decl., ¶ 126.

Another fact that demonstrates Petitioner's respect for the technology in the '479 patent is Petitioner's repeated and numerous citations to the '291 patent. The '291 patent, which establishes the priority date for the '479 patent,

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7 https://twitter.com/UniverseIce/status/1169611027266203648. "Ice Universe" is recognized as one of the leading industry observers in the Android space (and, more specifically, Samsung phones) and is known for publishing confidential industry information. *See, e.g., http://www.businesskorea.co.kr/news/articleView.html?idxno=59259* ("Ice Universe, a famous twitterian in the global IT industry").

8 https://optics.org/news/8/1/21.

9 https://www.photonics.com/Articles/OPPO_to_Collaborate_with_Corephotonics/a63427.

10 https://reportedtimes.com/computational-photography-market-to-develop-new-growth-story-emerging-segments-is-the-key/.

11 https://www.forbes.com/sites/gordonkelly/2015/01/14/iphone-6s-dual-lens-camera-optical-zoom/?sh=4936af1216c6.

is cited on the face of numerous patents assigned to Petitioner, such as U.S. Patent Nos. 9,769,389; 9,774,787; 9,781,345; 10,063,783; 10,122,931; 10,136,048; and 10,264,188. *See* Hart Decl., ¶ 127.

B. Commercial Success

Patent Owner's commercial success attributable to the invention of the '479 patent supports non-obviousness of the challenged claims. In 2019, Patent Owner was acquired by Samsung Electronics Benelux BV for a reported $155m. *See* Kali Decl. ¶ 16. Samsung's acquisition of Patent Owner was widely reported in industry news, e.g.:

- Paul Monckton, "Samsung Buys Significant New Camera Advantage Over Apple," Forbes.com (Jan. 29, 2019), https://www.forbes.com/sites/paulmonckton/2019/01/29/samsung-corephotonics/?sh=2c6c144b2de7 (accessed Jan. 25, 2021)

- Omri Zerachovitz, "Samsung buys Israeli co Corephotonics for $155m," Globes.com (Jan. 28, 2019), https://en.globes.co.il/en/article-samsung-buys-israeli-co-corephotonics-for-155m-1001270699 (accessed Jan. 25, 2021)

- Jon Fingas, "Samsung reportedly bought a company to improve its phone cameras," Engadget (Jan. 29, 2019), https://www.engadget.com/2019-01-29-samsung-reportedly-buys-corephotonics.html (accessed Jan. 25, 2021)

Patent Owner's acquisition by Samsung, one of the world's leading smartphone manufacturers, is evidence of Patent Owner's commercial access and is attributable to Patent Owner's innovative technology, including its smooth transition algorithms. It is thus evidence tending to support the non-obviousness of the challenged claims. *See* Hart Decl., ¶ 128.

C. Failure of Others / Copying

The failure of others, including Petitioner, to successfully address the problems stated in the '479 patent using position matching and image registration to reduce the image jump effect is evidence of the non-obviousness of the challenged claims. The evidence of Apple's copying of the '479 patent's technologies from Patent Owner also supports that conclusion. *See* Hart Decl., ¶ 130.

The failure of others, including the Petitioner, to solve the problems addressed in the '479 patent in the manner claimed by the '479 patent is evidence that suggests that the '942 patent's claims are non-obviousness. *See Heidelberger Druckmaschinen AG v. Hantscho Commercial Products, Inc.*, 21 F.3d 1068, 1072 (Fed. Cir. 1994) (the "argument that an innovation is really quite ordinary carries diminished weight when offered by those who had

tried and failed to solve the same problem, and then promptly adopted the solution that they are now denigrating.”).

Petitioner’s own long-standing failure to successfully write image fusion algorithms or design an effective long focal length telephoto lens design (such as the one Corephotonics provided to Apple) for its own iPhone projects using the technologies claimed in the ’479 patent until 2016, by which point Petitioner had had years of analysis, access, and experience with Patent Owner’s patented lens designs and image processing techniques, is further evidence of non-obviousness. Petitioner’s copying of Patent Owner’s technologies, including image fusion techniques that Patent Owner demonstrated to Petitioner and the telephoto lens designs it provided to Petitioner, is evidence of non-obviousness. *See* Hart Decl., ¶¶ 131-33. That Petitioner copied the invention of the ’479 patent (among other Corephotonics technologies, which Petitioner also appears to have copied) is strongly implied by the course of conduct between the parties and the timing of Petitioner’s announcement of their dual-aperture camera in their iPhone 7 series in Fall of 2016. In that generation, Apple introduced its still-image fusion feature for the first time. *See, e.g.*, “What's new in Camera Capture on iPhone 7 and iPhone 7 Plus,” https://forums.developer.apple.com/thread/63347 (Authored by “Apple

Staff"): "When zoomed, the Dual camera intelligently fuses images from the wide-angle and telephoto cameras to improve image quality. This process is transparent to the user and happens automatically when you take pictures using AVCapturePhotoOutput or AVCaptureStillImageOutput."

Numerous of Petitioner's own camera and image processing patents cite the '291 patent (to which the '479 patent claims priority), as previously explained. This suggests Apple has built its own camera and image processing technology based on the technology at issue in the '479 patent. All of these facts support a conclusion that the challenged claims are not obvious. *See* Hart Decl., ¶ 134.

X. CONCLUSION

For the reasons set forth above, Corephotonics respectfully requests that the Board affirm the validity of claims 1–16, 18, 23–36–38, and 40 of the '479 patent.

Dated: February 4, 2021

/Neil A. Rubin/
Neil A. Rubin (Reg. No. 67,030)
RUSS AUGUST & KABAT
12424 Wilshire Boulevard, 12th Floor
Los Angeles, CA 90025
Telephone: 310-826-7474

Attorney for Patent Owner,
COREPHOTONICS, LTD.

CERTIFICATE OF WORD COUNT

I certify that there are 9390 words in this paper, excluding the portions exempted under 37 C.F.R. § 42.24(a)(1), according the word count tool in Microsoft Word.

/Neil A. Rubin/
Neil A. Rubin (Reg. No. 67,030)

CERTIFICATE OF SERVICE

I hereby certify that "Patent Owner's Response to Petition for *Inter* Partes Review," and accompanying exhibits was served on February 4, 2021 by email sent to:

Michael S. Parsons
Andrew S. Ehmke
Jordan Maucotel
HAYNES AND BOONE, LLP
2323 Victory Ave. Suite 700
Dallas, TX 75219
Telephone: 214-651-5000
Email: michael.parsons.ipr@haynesboone.com
Email: andy.ehmke.ipr@haynesboone.com
Email: jordan.maucotel.ipr@haynesboone.com

/Neil A. Rubin/